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*Hemmole*  
RAILWAY ECCENTRICS.

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INCONSISTENCIES OF MEN OF GENIUS

EXEMPLIFIED

In the Practice and Precept

OF

ISAMBARD KINGDOM BRUNEL, ESQ.,

AND IN

THE THEORETICAL OPINIONS

OF

CHARLES ALEXANDER SAUNDERS, ESQ.

SECRETARY TO THE GREAT WESTERN RAILWAY.

BY VIGIL.

"How worthy are they to smart, that marre the harmony of our peace, by the discordous jars  
of their new paradoxall conceits."—BISHOP HALL.

LONDON:

JOHN OLLIVIER, 59, PALL MALL.

1846.



## THE ARGUMENT.

### PART I.

*Shows how Mr. Brunel, in 1838, persuaded the Directors of the Great Western Railway to adopt the Broad Gauge, assuring them that this Railway would have "no connexion with any other of the main lines," and how, in 1845, he attempted to force a connexion between it and the main lines at Wolverhampton, Rugby, Dorchester, &c.—How Mr. Brunel stated that carriages and trucks would not pass from one railway to another, being different properties, whereas more than half a million are passing annually at the present time.—How Mr. Brunel, in 1838, adopted the Broad Gauge, for the express reason that the Railway would be nearly level, and have very slight curves; and how, in after years, he applied the Broad Gauge to Railways having the steepest gradients, and the sharpest curves.—How Mr. Brunel said, in 1839, that "he never recommended the Broad Gauge for the purpose of having larger engines;" and how, in 1845, it was his boast "that he was building engines wider and larger."—How Mr. Brunel selected the Broad Gauge because it would enable him to place the bodies of the carriages within the wheels, and how he has always brought them outside the wheels.—How Mr. Brunel advocates the Atmospheric system, which in all essential points is the exact converse of the Broad Gauge Locomotive System.*

### PART II.

*Shows what Mr. Saunders thought of Competition in 1844, when he was a disinterested party, and what he said about Competition, when he was an interested party.*

11-6-31

Transport

## PART I.

THE evidence of engineers and others acquainted with the practical working of railways, for and against the Broad Gauge, is very analogous in its proportions to the geographical extent of the two systems. There exist more than 2000 miles of Narrow Gauge, and rather less than 300 miles of Broad Gauge Railways ; so we have every practical *railway* engineer denouncing the Broad or seven feet Gauge, and only Mr. Brunel attempting to defend it,—at least *seven* first-rate safe engineers against one eccentric genius, “ so studiously changeling,” as Boyle says, “ that he esteems an opinion as a diurnal, after a day or two, scarce worth the keeping.” Moreover, the old law maxim, “ Aliquis non debet esse judex in propriâ causâ,” is reversed in Mr. Brunel’s case. He has not been able to find a SINGLE independent *railway* engineer to back his eccentricity, for we cannot regard Mr. D. Gooch of the Great Western as but Sancho to Don Quixote. Mr. Brunel’s

4 *Broad Gauge to have no Connexion with Main Lines.*

case has been Broad Gauge and Mr. Brunel, against Narrow Gauge and all other railway engineers, British and foreign, including even Mr. Brunel, *his own self*. Yes, Mr. Brunel's own self; for his practice and precepts are a "hateful siege of contraries," which we proceed to exemplify from Mr. Brunel's own words and deeds.

And first we will show—

*How Mr. Brunel purposed that his Great Western should have no connexion with any other of the main lines.*

In 1838, Mr. Brunel reported that the difference of Gauge amounted to a prohibition to almost any railway running northwards from London, but that it mattered not to the Great Western, as that line was to be insulated from all other railways.

These are his words, from his Report to the Directors of the Great Western, dated Dec. 13th, 1838, p. 17:—

"I shall now consider the subject of the width of Gauge. The question of the disadvantage of differing in point of Gauge from other Railways, and the consequent *exclusion from communication with them is the first. This is undoubtedly an inconvenience; it amounts to a prohibition to almost any Railway running northwards from London*, as they must all more or less depend for their supply upon other lines or districts where Railways already exist, and with which they must hope to be connected. In such cases *there is no alternative.*

The Great Western Railway, however, broke ground in an entirely new district, in which railways were unknown. At present, it commands this district, and has already sent forth branches which embrace nearly all that can belong to it, and it will be the fault of the company if it does not effectually and permanently secure to itself the whole trade of this portion of England with that of South Wales and the south of Ireland; not by a forced monopoly, which could never long resist the wants of the public, but by such attention to these wants as shall render any competition unnecessary and hopeless. Such is the position of the Great Western Railway. *It could have no connexion with any other of the main lines*, and the principal branches likely to be made were well considered, and almost formed part of the original plan; nor *can these be dependent upon any other existing lines for the traffic which they will bring to the main trunk*. The Great Western was therefore free to adopt its own dimensions, and none of the difficulties which would entirely prevent such a course in the north of England had any existence in the west, and consequently all the general arguments advanced, and the comparisons made, on *the supposition of such difficulties occurring—all excellent in case they did*—are totally inapplicable to the particular case of the Great Western Railway, to which they have no reference whatever.\*

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\* Mr. Wyndham Harding shows, “that these views of laying out railways are proved, by the events of the last eight years, to be entirely fallacious.

“The map, with the railways constructed, in progress, and projected, marked upon it, including the branches of the Great Western Railway itself, is the best answer to them—it is there evident that railways are spreading themselves over the face of the country like a network, and are intersecting each other at a hundred different points.

“Where, then, shall we fix the boundaries of the districts, the railways in which are to have no connexion with those in any other?

“The completed or projected branches of the Great Western Railway itself—which was expected, as we have seen, to have no

In 1838, Mr. Brunel showed to the Directors of the Great Western, in his Report of the 13th Dec., that the West of England was not to be a "Country of Railways." Any one has only to look at a railway

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connexion with any other existing line—now join it to most of the other main lines in the country. For instance:—

"To the Grand Junction, and to the projected Shrewsbury and Birmingham Railways, at Wolverhampton.

"To the Grand Junction, London and Birmingham, and Midland Railways, at Birmingham.

"To the London and Birmingham, the Midland, and the proposed Trent Valley and Churnet Valley Lines, at Rugby.

"To the London and Birmingham Railway again, at Warwick.

"To the Birmingham and Gloucester Railway, at Cheltenham and Worcester.

"To the South Western Railway, at Basingstoke and Salisbury.

"To the projected Dorchester and Southampton Railway, at Dorchester.

"To the proposed Welsh Midland Line, at Hereford and Swansea.

"To the Bristol and Gloucester Line, with which it is already connected, at Bristol and Stonehouse.

[All these are Narrow Gauge lines, with the exception of the last, which is a Broad Gauge line at present; but its proprietors have announced their desire and intention of obtaining powers to convert it into a Narrow Gauge line.]

"And if the Great Western Railway, with its Broad Gauge branches, does not go to these lines, they with their Narrow Gauge Branches will come to the Great Western.\* Thus con-

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\* *Note to 4th Edition.*—The projected lines on the map, excluding all directly competing lines, give rise to about twenty points of Break of Gauge, beyond those mentioned above; in all,

map to see how Mr. Brunel's prescience has been fulfilled. The following extracts from his evidence before the Gauge Commissioners, make it clear from his own statements, that the West of England is to be

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necting by railway almost every county and town in the kingdom with every other.

"What are all these branches projected for, except to bring traffic from the lines and districts with which they communicate, or to take traffic to them from one extremity of the country to another? and therefore over the Narrow Gauge on to the Broad Gauge, or over the Broad Gauge on to the Narrow Gauge? The difficulties attending a change of Gauge, then, which, as was admitted, would in 1838 'have entirely prevented in the north such a course' as one railway adopting different dimensions from the rest, now have 'existence in the west.'"—*The Gauge Question; Evils of Diversity of Gauge, and a Remedy.* By Wyndham Harding. Weale, 59, Holborn.—A very able exposition of the question, written long before the battle of the Gauges began.

The same gentleman also deposed before the Gauge Commissioners, that (4510), starting from Oxford, a Broad Gauge line, a Bill for which has been passed, is projected from Oxford to Rugby, and that a branch from this to Birmingham is also projected, passing through Warwick, which has also received the sanction of parliament, and is subject to the decision, as regards the Gauge, of the Board of Trade. Another Broad Gauge line, extending from Oxford by Worcester to Wolverhampton, has also received the sanction of Parliament, subject to the same conditions as to Gauge between Worcester and Wolverhampton. A Broad Gauge line is projected from Oxford to Cheltenham, and so on to Gloucester. A Broad Gauge line is projected from near Worcester

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then, about thirty points of Break of Gauge, similar to that at Gloucester, will be established in the course of the next five years, if Government does not interfere to prevent it.



a country of railways—and of most inconvenient arrangements, if Mr. Brunel's recklessness is humoured :—

4067. (To Mr. Brunel.) You mentioned that a great proportion of the traffic coming from the Midlands and running upon the Oxford and Rugby line, would find its way down to Southampton?—I did not say anything about the proportion of traffic. I mentioned Southampton as being the ultimate point of that line. I do not know what the proportion of traffic would be ; I should say that, in all probability, from Oxford to Basingstoke, including Oxford, would be larger than Southampton ; but I do not feel competent to enter into it.

4068. What would be the various Gauges between those points, between Nottingham and Southampton, for instance ?—From Oxford to Basingstoke is Wide Gauge ; from Basingstoke to Southampton is Narrow Gauge.

4069. So that a carriage coming from Nottingham, or passengers coming from Nottingham, *would change their Gauge twice before they reached Southampton* ?—Yes.

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to near Ludlow. A Broad Gauge line is projected from Bristol to Monmouth, Hereford, and Leominster, joining the Worcester and Ludlow line near that place. A Broad Gauge line is also projected from Gloucester to Hereford. A Broad Gauge line is projected from Standish, proceeding by Newport, Cardiff, and Neath, into Pembrokeshire. From Ludlow a Broad Gauge line is projected, by Newtown, to Port Dynllaen. Another Broad Gauge line is projected from Ludlow, by Shrewsbury and Whitchurch, to Chester, near which a branch leaving it proceeds by Tarporley to Manchester on the one hand, and to Liverpool on the other, crossing the Grand Junction near Northwich. In the foregoing statement, *all the places named as those through which the lines in question pass, are points of intersection with other projected Narrow Gauge lines.* This statement refers exclusively to projects *north of Bristol and Oxford.*

But this "exclusion from communication," this "independence" of other lines and the "excellent arguments" based on the "difficulties" of two Gauges vanished, when it became Mr. Brunel's interest to make a railway running northwards. "The object of taking the Broad Gauge to Wolverhampton," then was declared by him to be, "to bring *the whole of the district into COMMUNICATION WITH a very large rich population, on the Broad Gauge Line by means of the Narrow Gauge.*—(Evidence before Oxford, Worcester, &c., Bills. 10,188.)

The "difficulties," too, are all now exploded, according to Mr. Brunel. Passengers may be easily shifted. The Great Western turns out from one carriage to another even its first-class passengers, when there are few, and all the second-class passengers, at its junctions at Didcot, Swindon, and Cirencester, "therefore," says Mr. Brunel, "the public do not object—nay, they like it." Moreover, it will be impossible, according to Mr. Brunel, to have carriages running from one line to another. He says :

I believe, that as the number of railways extends over the country, it will become more and more impossible to send individual passengers by separate carriages to the exact place of their destination, and that a change of carriages must, in a great many

10 *Change of Carriage inevitable—a trifling inconvenience.*

cases, take place, and if that change takes place over a general line of country, it will gradually influence the mode of travelling throughout all the directions in which lines may be carried, and will then, I think, amount to a very trifling inconvenience.\*—*Gauge Evidence*, 4029.

As respects goods, Mr. Brunel, alive to all the dis-

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\* Such a statement proves Mr. Brunel to be utterly ignorant of, or wilfully misrepresenting, the present working of the Railway system. On all the Northern, Midland, Norfolk, and Eastern Counties lines, the carriages are used almost in common. You get into a carriage at Darlington, and do not leave it till you reach London. So at Lancaster, so at Norwich. Hull wagons may be seen almost every day at Gloucester.

“To facilitate this interchange,” says Mr. W. Harding, who had for long a practical experience at Gloucester, “there is a central office, called the Railway Clearing-House, established in London, to which daily returns from the stations in the Narrow Gauge district are made, and each company is there charged for the use it has made of the carrying stock of the neighbouring lines.

“In order to obviate the delay, expense, annoyance, and frequent injury to goods, horses, cattle, and private carriages, which would occur were the carriage changed (as at a point of break of Gauge) at the junction of one line with another, it appears that the interchange of loaded vehicles shown by the returns of the Clearing-House between one Company’s line and another’s, is now going on at the following rate per annum:—

“Goods wagons (containing goods and cattle)—THREE HUNDRED AND SIXTY THOUSAND.

[This does not include the wagons belonging to private collieries, as these do not go through the clearing-house; they are, however, extremely numerous.]

“Passenger carriages (containing passengers)—ONE HUNDRED AND TWENTY THOUSAND;

“Horse boxes (containing horses)—EIGHTEEN THOUSAND;

advantages in 1838, glibly passes over all "difficulties" in 1845 :—

4029. As regards goods, it is, of course, a mere question of money; and if there is a considerable stream of goods on one line, and it is the interest of two parties meeting at a certain point to interchange those goods, I believe the inconvenience and expense will be so trifling that it is hardly worth consideration, if there are other important considerations in the question of the change of Gauge.

4048.—Having dealt with the passengers, and having had now

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"Carriage trucks (conveying private carriages)—TWELVE THOUSAND.

[Each of the classes of vehicles passes over two railways or properties. So regarding the numbers in reference to Mr. Brunel's doctrine of 1838, that no company would allow its vehicles to run on another company's line they should be doubled.]

"This interchange is daily increasing as railway traffic is developed.

"The system is evidently the correct one; and it was stated before the committee of the House of Commons on the contending schemes for the country immediately north of Oxford, that to the facilities which it affords, the vast increase in the goods traffic upon railways, which has taken place within the last three or four years, is mainly attributable.

"It appears, then, that the party who introduced the 7-foot Gauge after the 4 ft. 8½ in. Gauge had been in operation for some time over a large district of country, were, like many others, mistaken in their anticipations of the mode in which railways would be laid out and worked in connexion with each other as the system extended itself. It is necessary to show this, not only in order to satisfy ourselves that the arguments used to justify the introduction of a distinct and peculiar Gauge are not applicable to the present state of circumstances, but also in order to prove that the evils of a diversity of Gauge have long been foreseen by those experienced in railways."

some considerable time to think of the question of goods, since it was brought forward in the last session of Parliament, have *you made up your mind at all as to the mode in which you would arrange respecting them?*—*NO*; because it must depend upon what the other companies choose to do on the other side; if they do not afford assistance, I will not say if they throw impediments in the way, but if they do not afford assistance to exchange, the mode must be different from that which it would be if they did. As regards coal, there is no doubt that there would be every facility, because the mode of carrying an article in large quantities like coal will, no doubt, be influenced by the wishes and desires of the coal-owners, and the coal-owners will, of course, be desirous of doing whatever will encourage their trade with Oxford.

4049. You would have no difficulty with them?—I think we shall have no difficulty whatever with them. As regards general goods, it must depend upon what the other companies may choose to do; the worst that could happen, of course, *would be the entire unloading and reloading of the goods; even that does not amount to anything in time or money that would be much felt by the public.*—(Gauge Evidence.)

10,339. As a man of science, and acquainted with practical operations, have you any doubt whatever of the perfect feasibility of the transfer in the bodies of these carriages from the Narrow Gauge to the Broad, and on the wide the transfer of whole carriages of goods on trucks?—I have not the slightest doubt that it can be done very easily, and **AT A COST AND TIME THAT IS INAPPRECIABLE.**

10,340. It is inappreciable either as regards cost or time?—Yes. (*Mr. Brunel's Evidence before Select Committee, on Oxford, Worcester, &c. Railway Bills.*)

Thus, in 1838, be it noted, Mr. Brunel wanted to show that the Great Western would be a separate system from other railways; in 1845, that it would not and must not be a separate system, but must be put in connexion with all other railways.

*Mr. Brunel's practice confutes Mr. Brunel's reasons for  
choosing the Broad Gauge.*

In order to answer this question, let us take his own words, in his Report of Dec. 27th, 1838, (pp. 16-17,) to the Directors of the Great Western Railway:—

“ Upon all these points I have so frequently explained my views to you, that I shall take the liberty to quote a passage from my Report of the 15th of August, which contains in a small compass, grounds upon which I adhere to my opinions in favour of the width of Gauge I have selected:—‘ It has been asserted that 4 feet 8 inches, the width adopted on the Liverpool and Manchester Railway, is exactly the proper width for all railways, and that to adopt any other dimension is to deviate from a positive rule which experience has proved correct; but such an assertion can be maintained by no reasoning. Admitting, for the sake of argument, that, under the particular circumstances in which it has been tried, 4 feet 8 inches has been proved the best possible dimension, the question would still remain, What are the best dimensions, under the circumstances? Although a breadth of 4 feet 8 inches has been found to create a certain resistance on curves of a certain radius, a greater breadth would produce only the same resistance on curves of a greater radius. If carriages and engines, and more particularly if wheels and axles of a certain weight have not been found inconvenient upon one railway, greater weights may be employed and the same results obtained on a railway with *better gradients*. To adopt a Gauge of the same number of inches on the Great Western Railway as on the Grand Junction Railway would, in fact, amount practically to the use of a different Gauge in similar railways. The Gauge which is well adapted to the one is not well adapted to the other, unless, indeed, some mysterious cause exists which has

never yet been explained, for the empirical law which would fix the Gauge under all circumstances.'

"I take it for granted that in determining the dimensions in each case, due regard has been had to the *curves and gradients of the line which ought to form a most essential, if not the principal, condition.* In the Report of the Commissioners upon Irish Railways, the arguments are identically the same with those which I used when first addressing you on the subject, in my Report of October, 1835. The mechanical advantage to be gained by *increasing the diameter of the carriage-wheels* is pointed out; the necessity, to attain this, of increasing the width of way; the dimensions of the bridges, tunnels, and other principal works, not being materially affected by this; *but, on the other hand, the circumstances which limit this increase being the curves on the line, and the increased proportional resistance on inclinations, (and on this account it is stated to be almost solely applicable to very level lines,) and lastly, the increased expense which could be justified only by a great traffic.* The whole is clearly argued in a general point of view, and then applied to the particular case, and the result of this application is the recommendation of 6 feet 2 inches on the Irish railways. Thus an increase in the breadth of way to attain one particular object—viz., the capability of increasing the diameter of the carriage-wheels, without raising the bodies of the carriages, is admitted to be most desirable, but is limited by certain circumstances—namely, THE GRADIENTS AND CURVES OF THE LINE, and the extent of traffic. Every argument here adduced, and every calculation made, would tend to the adoption of about 7 feet on the Great Western Railway."

*Slight curves and level lines essential for the Broad Gauge, A.D. 1838.*

Here we have the real principle on which the Broad Gauge was advocated. It is clearly stated—so clearly that there can be no mistake about it :

“To adopt a Gauge of the same number of inches on the Great Western Railway as on the Grand Junction Railway would, in fact, amount practically to the use of a different Gauge on similar railways. I take it for granted that in each case due regard has been had to the curves and gradients of the line, which ought to form a most essential, if not the principal, condition. The circumstances which limit this increase (of Gauge) being the curves on the line, and the increased proportional resistance on inclinations (and on this account it is stated to be almost solely applicable to very level lines,) and lastly, the increased expense which could be justified only by a great traffic.

*Broad Gauge applied to sharp curves and steep  
inclines in A.D. 1845.*

The argument is: Various circumstances require various mechanical treatment. No two railways are alike, therefore no two railways should be of the same Gauge—such would be a strict application of the principle laid down by Mr. Brunel.

The preposterous fallacy of this notable doctrine is shown by Mr. Brunel's own practice. Everything he has done has contradicted it. In the railways connected with the Great Western Railway laid down by him, the curves and gradients—those “most essential conditions in determining the gauge”—are quite dissimilar to those upon the Great Western Railway. What are the curves and gradients on the Bristol and Exeter, the Bristol and Gloucester, the Cheltenham and Great Western Union, the South Wales, or the



Oxford and Rugby, and Oxford, Worcester, and Wolverhampton lines? Miles of gradients of 1 in 130; 1 in 200; 1 in 300; to say nothing of inclined planes of 1 in 70, and 1 in 80, will be observed, with curves of 40 chains radius, and even 20 and 30 chains, in place of the maximum gradients of 1 in 660, and the curves of never less than 80 chains radius on the Great Western line—the new lines named are, in short, of severer character than the Grand Junction and Liverpool and Manchester lines, which were pointed out by Mr. Brunel as *examples* of lines which required a totally different Gauge from that of the Great Western Railway.

Of course, it was to be expected that Mr. Brunel would recant his early theory about curves:

4008. You have stated in answer to a question put to you, that you formerly attached more importance to curves than you now do, will you be so good as to state why you now think that curves are a less objection to the Broad Gauge than you thought them previously?—I find by experience that the curves do not seem to affect our motion upon them more than they appeared to affect the motion of carriages upon Narrow Gauges; and I therefore was induced to look into the cause of this, which appeared to me contrary to my former views, and I satisfied myself that as long as the Gauge bears but a small proportion to the radius, the width of the Gauge does not affect at all the action of the wheel upon the curve, either by increasing the angle at which the wheel works upon the rail, or increasing the friction from any circumstance. The bad effect of a curve is aggravated only by the longitudinal distance of the axles from each other, and so long as the Gauge

forms only a small part of the radius, which, of course, in all practical cases it does, whether the two wheels are five feet apart or seven feet apart makes no difference in the friction or resistance in going round a curve, and even at high speeds. I have every-day experience of our running round curves certainly quite as small as one would wish to run round on the Narrow Gauge.—  
*Gauge Evidence.*

Mr. Brunel's tergiversations on the subject of engines, have been no less curious than his curvings on curves, his gradations on gradients, and his "connexions" with insulation, &c.

*How Mr. Brunel never recommended the Broad Gauge for the purpose of having larger engines, A.D. 1839, and how Mr. Brunel is now building engines wider and larger, A. D. 1845.*

To a special meeting of the Great Western Railway Company, on Jan. 9th, 1839, he stated as his belief that other engines were at their best, and that those on the Great Western line were not at their best, although they were getting to it. *He had never recommended the GAUGE FOR THE PURPOSE OF HAVING LARGER ENGINES*; it was that the carriages might be enlarged.

Then, in 1845, he showed the Select Committee on Oxford, Worcester, &c., Bills, that (9836) the power practically depended upon the evaporating power of the boiler; "of course, you must have a large cylinder

to get the power ; it is of no use having a large cylinder unless you have a boiler capable of evaporating sufficient water, giving the power that you afterwards use by the cylinder," that he was (10,140) " building large engines," both (10,136) " larger and wider." And before the Gauge Commissioners we find the following to have passed :—

3931. Having seen the working of other railways, and of the Great Western since its entire opening, are you at all inclined to think that it was an injudicious arrangement to alter the Gauge to seven feet, or that a less difference would have been better?—To answer that, as I will endeavour to do, with candour, I incur the risk, I am afraid, of being accused of adopting even wild notions : I should rather be above than under seven now, if I had to re-construct the lines.

3932. Will you state your reasons for thinking that even a *wider gauge* would be desirable?—Applying the same principle that led me to consider that for the work to be done the machine was too small in the case of the four feet eight and a half, I think that the work which we easily can perform, and desire to perform upon railways, would be better performed by even a slightly larger system of machinery than we have ; I do not mean much larger, but, I think, slightly larger.

3933. In fact, you think it of advantage to have a heavier engine and a more powerful engine, so as to be capable of taking any amount of traffic that may be brought to any train?—Not merely as regards the engine, but as regards the whole machinery of the system : all the parts of the great machine of the railway system.

3948. Are you constructing, or proposing to construct, **ENGINES OF GREATER POWER AND GREATER weight** upon the Great Western Railway?—Yes.

Again—

6437. I may mention that *we are now building an engine with very considerably more evaporating space than our largest present engines*, and you can see the drawings of that, and you will see that on our Gauge, with our arrangements, *we are capable of having engines of very much greater capabilities than our present engines. We can double our largest engines now on the line without making any inconveniently large or heavy machinery, whereas the engines*, which, I presume, will be used in the experiments upon the Narrow Gauge, I believe you will find to be the result of straining very much the dimensions of the machine.

*How Mr. Brunel proposed to increase the diameter of wheels, and to place the bodies of carriages within the wheels, and how he did neither.*

Mr. Brunel, in his second Report to the Great Western Directors, says—

“On the subject of the seven feet Gauge I can add very little to what I have said before; it was adopted expressly to enable us to effect that arrangement which is recommended at page seventy-six.”

And then, quoting from himself, he adds—

“We see that there is a diminution of friction by *the increase of the diameter of the wheels*; but it is doubtful to what extent this is modified by elevating the bodies of the carriages; a Broad Gauge, *by allowing the bodies of the carriages to be placed within the wheels*, and thus to reduce the height of the carriages, and consequently diminish the area of the frontage, is an advantage, considering the great amount of resistance arising from the atmosphere. To effect this, with the most convenient form of body, similar to that ordinarily adopted on railways, does require, as I have frequently stated in previous reports, a width of at least 6 feet 10 inches.

These are prominent objects of the Broad Gauge.

How have they been realized by Mr. Brunel's practice? *No carriages are placed within the wheels.* It may be doubted if a single carriage on the Great Western has ever been placed within the wheels; the *diameter of the wheels has not been increased*, but reduced in the new stock to 3 feet 6.

*How Mr. Brunel has used the Narrow Gauge.*

Mr. Brunel was engineer of the Taff Vale Railway, from Merthyr to Cardiff; it was made a *Narrow Gauge* Railway at his recommendation—why, he could not remember, before the Oxford and Worcester Committee, in 1845, (see Evidence No. 10,048 to 10,053.) But he thus explained to the Gauge Commissioners some of his reasons:—

3980. Will you state the circumstances which induced you to depart from your more general system in that particular instance? —One of the reasons, I remember, was one which would not influence me now; but at that time I certainly assumed that the effect of curves was such, that the radius of the curve might be measured in units of the Gauge, in which I have since found myself to have been mistaken. Then I expected to have to lay out that line with a succession of curves of small radius, which is the case as the line is laid out; and I assumed that the Narrow Gauge was better than the Wide Gauge as regards curves. I do not remember whether connexion with any other railways there, or likely to be there, influenced me.

He is also engineer of some foreign lines—the railway from Genoa to Turin, upon which, having a free choice, he chose the Narrow Gauge:

3992. The reason, says he, which led me to adopt it was this, that I did not think that *either the quantities* or speeds likely to be demanded for many many years to come, in that country required the same principle to be carried out that I thought was required here ; and I thought it very important that they should secure the goodwill of certain other interests which would lead into and out of this railway ; and, as a question of policy as much as of engineering, I advised them to adopt that Gauge. I thought it was wise to conciliate the interest of the Milan and Venice Railway, and others which are likely to be connected with us.

Genoa, however, he explained (4003), to be “ a large importing and exporting place, with a populous district,” where the traffic would be equalled by the traffic on the projected line to Port Dynllaen from Oxford, which is to be a *Broad Gauge*, so that the *same quantities* of traffic are reasons with Mr. Brunel for *different* Gauges !

It is well known that Mr. Brunel is an

*Advocate for the Atmospheric System.*

It matters not that this involves paradoxes without end. The Atmospheric System is a system which in all its peculiarities, and the advantages claimed for it as opposed to the Locomotive System, is the EXACT CONVERSE OF THE BROAD GAUGE LOCOMOTIVE SYSTEM.

The peculiarities of the Broad Gauge, and the conditions necessary to its existence, as described by Mr. Brunel, are precisely what the Atmospheric System

is designed to avoid, and which it represents as evils of the first magnitude.

For instance, the advocates of the Broad Gauge claim, first and foremost, an advantage in their system, admitting of the use of LARGER AND HEAVIER LOCOMOTIVE ENGINES than the NARROW GAUGE.

The advocates of the Atmospheric System represent the danger, the expense, the wear and tear of the road contingent upon the use of locomotive engines, as fearful, and as increasing with the weight of the engine employed and the speed at which they travel ; and they claim as the first distinctive advantage of their system, that they dispense with this prodigious hammer.

Mr. Brunel thus, at the same time, advocates the system which claims as its peculiar advantage its capacity for running the heaviest locomotive engine which can be constructed, at the highest speed, before every train of carriages ; and the system which represents such an engine so running, as dangerous and most objectionable.

Again, the Broad Gauge, Mr. Brunel tells us, is applicable only to easy curves, and the curves were all brought to a mile radius, at great expense.

The advocates of the Atmospheric, on the other hand, recommend their system *because* it admits of

the sharpest curves, such as those used at Dalkey, which have yet been heard of on Passenger Railways.

Now, it is obvious that the long axles of the Broad Gauge can never make the circuit of sharp curves but with far greater twisting and danger than the shorter axles of the Narrow Gauge. It requires no profound knowledge of mechanics to see this.

How then can you reconcile a system whose peculiar advantage and saving, lies in admitting very sharp curves, with another system, whose peculiar necessity it is to require very flat or easy curves ?

The atmospheric advocates again say, that the true secret of public accommodation consists in running light trains frequently—every half-hour or so, as at Dalkey and Croydon, which is what their system admits of ; and that large trains (which their system does not admit of) are very objectionable and inconvenient to the public.

Mr. Brunel and the Broad Gauge advocates, on the other hand, contend that the true secret of safety and economy lies in running a few heavy trains in the course of the day, and that the large engines of the Broad Gauge are advantageous, *because* they enable them to adopt this safe, economical, and proper mode of working a railway.



How are these clashing doctrines, as to public convenience, to be reconciled ?

If the atmospheric advocates, (and Mr. Brunel is an atmospheric advocate,) are right in contending that a railway should be worked with light and frequent trains, how can the advocates of the Broad Gauge locomotive system, (and Mr. Brunel as the principal advocate,) be also right in maintaining that a railway should be worked with a few heavy trains daily, drawn by large engines. If the first position is admitted, the last position must be abandoned, and the inducements which the Broad Gauge advocates tell us they have to run only a few large and heavy trains a day, so as to give their large engines suitable loads, must be regarded as a misfortune to the public, and an objection to the system, not an advantage.

So it is in several other respects ; in short, the atmospheric system of railway making and working, and the Broad Gauge system of railway making and working, are the antipodes of each other ; if one is the true and convenient system, the other must be the false and inconvenient system, and it is only a "man of genius," like Mr. Brunel, who revels in the paradoxical, that would endeavour to keep these two plates upright at the same moment.

## PART II.

*Shows what Mr. Saunders thought of Competition in 1844, when he was a disinterested party, and what he said about Competition, when he was an interested party.*

THE main supporter of the Broad Gauge, as we have seen, is Mr. Brunel. In fact he is the Atlas who alone upholds it; but he has a satellite in words no less bold than himself! Mr. Charles Alexander Saunders, whose part it is to asseverate all that Mr. Brunel asserts; and he does so without any scruples at all, upholding Mr. Brunel's eccentricities, garnished with a few inconsistencies of his own.

Mr. Saunders well repays, with untiring zeal and unscrupulous advocacy, the spontaneous donation of the Great Western to him, of £10,000, and their liberal salary of £2000 a year. He avows that he does not "pretend to mechanical knowledge, or any engineering skill," nevertheless, he is "convinced that the Broad Gauge can carry greater loads at a much higher speed, and with greater smoothness and safety than the Narrow Gauge," (Gauge Evidence, 3823.) We need not examine the weight of Mr. Saunders' testimony in respect of the mechanism of his Railway.

He echoes all that Mr. Brunel has said and done, with all its contraries of precept and practice. The more eccentric Mr. Brunel's conduct is, the more it proves to Mr. Saunders' mind its surpassing excellence. The more all Engineers object to his crotchets, the more it affords to Mr. Saunders' mind "one of the strongest proofs of the great advantage of the Gauge itself."—(Gauge Evidence, 3887.)

But upon the principles of managing a Railway, as "one who has had a great deal to do with the working of Railways"—i.e., the Great Western only—Mr. Saunders may be supposed competent to speak. He has often spoken of the PRINCIPLE OF COMPETITION. So long as the Great Western kept itself within its self-appropriated district—no one more loud and constant than Mr. Saunders against competition. He looked upon it as a sort of misfortune to Railways, "a destructive principle," a thing that would "inflict unjustifiable injury," that would "destroy national improvement," &c. But as soon as Mr. Brunel attempted to force his Broad Gauge northwards beyond its district, and found that to succeed at all it *must* "have connexion with other lines," Mr. Saunders forthwith recanted, and crept out of his bold denunciation of competition. His words are seen best in juxta-position, and afford the most singular specimen of self-contradiction :—

What Mr. Saunders thought of  
COMPETITION in 1844, when he  
was a *disinterested* party.

(*Extract from the Fifth Report of the  
Select Committee on Railways, 1844.*  
Mr. C. A. SAUNDERS *under examina-  
tion.*)

4148. Q. The London and Birmingham Railway charges 30s. for a first-class passenger, and 20s. for a second-class passenger, to Birmingham, the maximum being a little higher as regards the first-class passengers, and considerably higher as regards the second-class passengers—I understand you to say, that if a body of persons competent in respect of capital were to come forward to Parliament and to say, “We are ready to make a Railway, and to give all the accommodation that the existing Railway gives, and to carry the first-class passengers at 20s., and the second-class at 15s.,” Parliament ought not to sanction those parties in going forward with their project?

A. *Most undoubtedly I do say that.*

4149. Q. Do you think that Parliament will act upon the view you have laid down?

A. I have great confidence that they

What Mr. Saunders said  
about COMPETITION in  
1845, when he was an  
interested party.

(*Extract from the Minutes of  
Evidence taken before the  
Select Committee on the  
Oxford, Worcester, &c.,  
Railway Bills, in 1845.*  
Mr. C. A. SAUNDERS *under  
examination.*)

12029. In your opinion would it be desirable for the public, as regards the South Staffordshire district, and the district to the north of it as far up as Liverpool, all that district now occupied by the Grand Junction, that there should be a competing line between those districts and London?

I think a second line  
to London, which would

